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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/577,160

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EXAMINER

WILSON, MICHAEL H

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/577,160	Applicant(s) TSUBOYAMA ET AL.	
	Examiner MICHAEL WILSON	Art Unit 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2,8,14 and 15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2,8,14 and 15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. This Office action is in response to Applicant's amendment filed 1 October 2009, which cancels claims 1, 3-7, and 9-13 amends claims 2 and 8, and adds new claims 14 and 15.

Claims 2, 8, 14, and 15 are pending.

2. The rejection of claims 2 and 3 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention is moot due to applicants canceling of the claims in the reply filed 1 October 2009.

3. The rejection of claims 1, 2, 6, 8, 10, and 12 under 35 U.S.C. 102(b) as being anticipated by Yam et al. (Photophysics and photochemical reactivities of organocopper(I) complexes. Crystal structure of $[\text{Cu}_2(\text{PPh}_2\text{Me})_4(\mu, \eta^1\text{-C}\equiv\text{CPh})_2]$) is overcome due to applicants cancelling or amending of the claims in the reply filed 1 October 2009.

4. The rejection of claims 1, 3, 8, 10, and 12 under 35 U.S.C. 102(b) as being anticipated by Engelhardt et al. (Synthesis and structure of copper(I), silver(I) and zinc(II) amides $[\text{Cu}_2(\text{mpsa})_2]$, $[\text{Cu}_6\text{X}_2(\text{mpsa})_4]$ (X = Cl or Br), $\{\text{Ag}_4(\text{mpsa})_4\}$ and $[(\text{ZnEt})_2(\text{mpsa})_2]$ [mpsa = 2-N(SiMe₃)-C₅H₃N-6-Me]) is overcome due to applicants cancelling or amending of the claims in the reply filed 1 October 2009.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 2, 8, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Igarashi et al. (US 2001/0019782 A1) in view of Yam et al. (Photophysics and photochemical reactivities of organocopper(I) complexes. Crystal structure of $[\text{Cu}_2(\text{PPh}_2\text{Me})_4(\mu, \eta^1\text{-C}\equiv\text{CPh})_2]$).

Regarding claims 2, 8, 14, and 15, Igarashi et al. disclose a light emitting device comprising an organic layer between a pair of electrodes with a first organic layer (hole transport layer) between the anode and the light-emitting layer and a second organic layer (electron transport layer) between the cathode and the light-emitting layer ([0137] and [0169]). The reference also discloses the light-emitting material in the light-emitting layer is doped in to a host material [0169]. However the reference does not explicitly disclose a copper dimmer complex as light-emitting material.

Yam et al. teach a luminescent binuclear copper(I) complex (compound 2, page 2889). The reference teaches the complex emits light in the solid state at both room temperature and 77K (page 2890, first column, lines 31-33). Complex 2 meets instant formula (2) wherein N is part of a pyridyl ring, and R1, R2, R1', and R2' are trimethylsilyl groups. The reference also teaches the Cu...Cu distance of 2.4 angstroms (page 2890, first column, lines 5-6) and that the copper ions are monovalent (page 2889, first paragraph).

It would be obvious to one of ordinary skill in the art at the time of the invention to try combining the copper dimmer complex of Yam et al. with the light-emitting layer of Igarashi et al. One of ordinary skill in the art would reasonably expect such a combination to be suitable given that Igarashi et al. teaches phosphorescent metal complexes to be suitable [0013] and Yam et al. teach the copper dimmer complex to be phosphorescent.

Response to Arguments

8. Applicant's arguments filed 1 October 2009 have been fully considered but they are not persuasive.

Applicants argue that while Yam et al. (Photophysics and photochemical reactivities of organocopper(I) complexes. Crystal structure of $[\text{Cu}_2(\text{PPh}_2\text{Me})_4(\mu, \eta^1\text{-C}\equiv\text{CPh})_2]$) does not mention specific conditions for measuring the emission (luminescence) properties of Complex 2, it is reasonable to infer that when the emission properties of Complex 2 in the solid state and in solution are measured under the same

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conditions, then photoluminescence is observed. Yam et al. observes the compound's emission properties by exposing the compound to light. Yam et al. does not disclose measuring the emission properties by applying a voltage to a sample with the electrodes in contact with the sample. The examiner agrees that Yam et al. measures and studies the photoluminescence of Complex 2. However because Yam et al. discloses that Complex 2 is luminescent it is the examiner's position that it would be obvious to try using the complex as luminescent material in an electroluminescent device. One of ordinary skill in the art would readily expect a complex which is photoluminescent to also be electroluminescent. The primary difference between photoluminescence and electroluminescence is the method of exciting to complex to the excited state. Once in the excited state the processes available for the complex to return the ground state are the same. Therefore if a complex phosphoresces when excited by light it is reasonable to expect the complex to also phosphoresce when excited by electricity. Kukhto (Electroluminescence of Thin Films of Organic Compounds (Review)) a review article from 2003 discussing electroluminescent this films also notes that the electroluminescent spectrum of a complex usually coincides fairly well with the photoluminescent spectrum (page 170, the luminescence spectra).

Applicants also argue that Examples 10 and 11 in the present specification use different concentrations (% by weight) of copper coordination compound in the luminescent layer, (Ex. 10: 10%; Ex. 11: 100%). As shown in Table 11, Examples 10 and 11 achieve luminescence efficiencies of 11.0% and 8.2%, respectively. Therefore, applicants assert, that the luminescent layer with a concentration of 10% copper

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complex demonstrates that organic EL devices using the copper coordination compound of formula (2) as a guest material produce unexpectedly superior results. However an increased efficiency as a result of reduced concentration is not considered to be an unexpected result. Concentration quenching is a known phenomenon that occurs in luminescent layers. Kukhto (Electroluminescence of Thin Films of Organic Compounds (Review)) discusses concentration quenching (page 173) and also cites doping as an effective method of increasing EL efficiency (page 174, Methods of increasing the EL Efficiency, first paragraph). One of ordinary skill in the art at the time of the invention would understand the concept of concentration quenching and would not find an increase in efficiency of a doped phosphorescent material over an undoped phosphorescent layer to be surprising.

Applicants also argue that Yam et al. teaches that the emission properties of a sample, when it is contained in a liquid, are inferior to those in its bulk state. It is taught, applicants argue, that Complex 2 in the solid state (in the bulk state wherein it is not in some medium) exhibits superior lifetimes. Complex 2 in the liquid state is dispersed or dissolved in some medium, exhibits inferior lifetimes. Therefore, applicants assert, if at all, unsatisfactory lifetimes when present as a guest, would be suggested by Yam et al. However in a solution molecular are more energetic than in a fixed solid matrix, there are considerably more collisions of a luminescent molecule with solute and solvent molecules in a solution than in a solid which can result in deactivation of the excited state (external conversion). One of ordinary skill in the art at the time of the invention would understand these factors which affect the luminescent lifetime and therefore

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would not be surprised by a reduction of the lifetime in solution. Skoog et al. (Principles of Instrumental Analysis) is a college level instrumental analysis text book briefly explains external conversion (External conversion, page 284) demonstrating that the reduction in lifetime observed by Yam et al. would not be surprising and would not discourage one of ordinary skill in the art from using the copper complex in a doped solid layer.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MICHAEL WILSON** whose telephone number is (571)

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270-3882. The examiner can normally be reached on Monday-Thursday, 7:30-5:00PM EST, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

MHW